

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# TC7WBD125FK

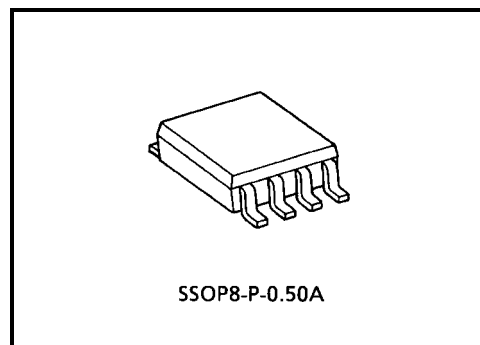
## Dual Bus Switch with Level Shift

The TC7WBD125FK is a low on-resistance, high-speed CMOS 2-bit bus switch. This bus switch allows the connections or disconnections to be made with minimal propagation delay while maintaining Low power dissipation which is the feature of CMOS.

When output enable ( $\overline{OE}$ ) is at low level, the switch is on; when at high level, the switch is off.

The internal diode which adds to power supply line is enable to realize the shift of signal level from 5 V to 3.3 V. (Note 1)

All inputs are equipped with protector circuits to protect the device from static discharge.



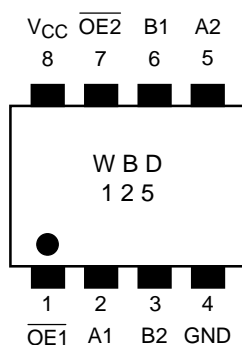
Weight: 0.01 g (typ.)

## Features

- Operating voltage:  $V_{CC} = 4.5 \sim 5.5$  V
- High speed operation:  $t_{pd} = 0.25$  ns (max)
- Ultra-low on resistance:  $R_{ON} = 5 \Omega$  (typ.)
- Electro-static discharge (ESD) performance:  $\pm 200$  V or more (JEITA)  
 $\pm 2000$  V or more (MIL)
- TTL level input (control input)
- Package: US8

Note 1: In case that over-shoot noise is detected, this device should be used with clamp diode to prevent the next stage device from over-stress.

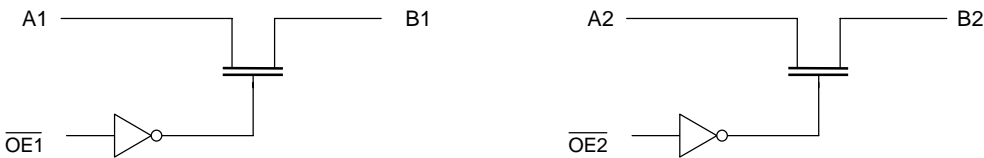
## Pin Assignment (top view)



Truth Table

Inputs	Function
OE	
L	A port = B port
H	Disconnect

System Diagram



Maximum Ratings

Characteristics	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	-0.5~7.0	V
Control pin input voltage	$V_{IN}$	-0.5~7.0	V
Switch terminal I/O voltage	$V_S$	-0.5~7.0	V
Clump diode current	$I_{IK}$	-50	mA
Switch I/O current	$I_S$	128	mA
Power dissipation	$P_D$	200	mW
DC $V_{CC}$ /GND current	$I_{CC}/I_{GND}$	$\pm 100$	mA
Storage temperature	$T_{stg}$	-65~150	°C

Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	4.5~5.5	V
Control pin input voltage	$V_{IN}$	0~5.5	V
Switch I/O voltage	$V_S$	0~5.5	V
Operating temperature	$T_{opr}$	-40~85	°C
Control pin input rise/fall time	$dt/dv$	0~10	ns/V

## Electrical Characteristics

## DC Characteristics (Ta = -40~85°C)

Characteristics		Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Typ. (Note 2)	Max	Unit
Control pin input voltage	"H" level	V <sub>IH</sub>	—	4.5~5.5	2.0	—	—	V
	"L" level	V <sub>IL</sub>	—	4.5~5.5	—	—	0.8	
High-level output voltage		V <sub>OH</sub>	Figure 4	—	—	—	—	—
Input leakage current		I <sub>IN</sub>	V <sub>IN</sub> = 0~5.5 V	4.5~5.5	—	—	±1.0	μA
Power off leakage current		I <sub>OFF</sub>	A, B, $\overline{\text{OE}}$ = 0~5.5 V	0	—	—	±1.0	μA
Off-state leakage current (switch off)		I <sub>SZ</sub>	A, B = 0~5.5 V, $\overline{\text{OE}}$ = V <sub>CC</sub>	4.5~5.5	—	—	±1.0	μA
ON resistance (Note 3)	R <sub>ON</sub>	V <sub>IS</sub> = 0 V	I <sub>IS</sub> = 64 mA	4.5	—	5	7	Ω
			I <sub>IS</sub> = 30 mA	4.5	—	5	7	
		V <sub>IS</sub> = 2.4 V, I <sub>IS</sub> = 15 mA		4.5	—	35	50	
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>OUT</sub> = 0	switch ON	5.5	—	—	1.5	mA
			switch OFF	5.5	—	—	10	μA
	ΔI <sub>CC</sub>	V <sub>IN</sub> = 3.4 V (one input)		5.5	—	—	2.5	mA

Note 2: The typical values are at V<sub>CC</sub> = 5 V, Ta = 25°C.

Note 3: Apply the specified current to the switch, then measure the voltages on pins A and B. The on-resistance is the lower of the two.

## AC Characteristics (Ta = -40~85°C)

Characteristics		Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Max	Unit
Propagation delay time (bus to bus)	t <sub>pLH</sub> t <sub>pHL</sub>	Figure 1, Figure 2	(Note 4)	4.5	—	0.25	ns
Output enable time	t <sub>pZL</sub> t <sub>pZH</sub>	Figure 1, Figure 3		4.5	—	4.5	ns
Output disable time	t <sub>pLZ</sub> t <sub>pHZ</sub>	Figure 1, Figure 3		4.5	—	5.0	ns

Note 4: The propagation delay time is calculated by the RC (on-resistance and load capacitance) time constant.

## Capacitive Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	V <sub>CC</sub> (V)	Typ.	Unit
Control pin input capacitance		C <sub>IN</sub>	(Note 5)	5.0	3	pF
Switch terminal capacitance		C <sub>I/O</sub>	$\overline{\text{OE}}$ = V <sub>CC</sub> (Note 5)	5.0	10	pF

Note 5: This parameter is guaranteed by design.

Switch

- Open
- 7.0 V
- GND

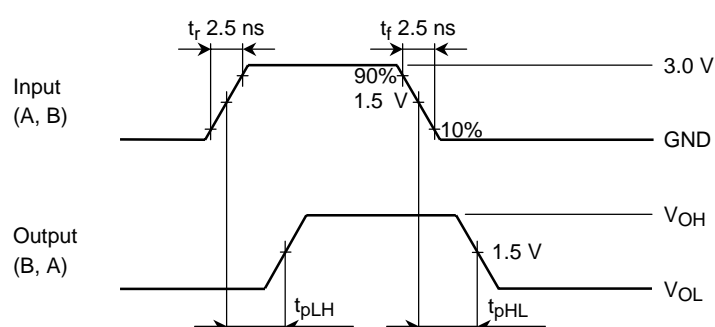
Output

Measure

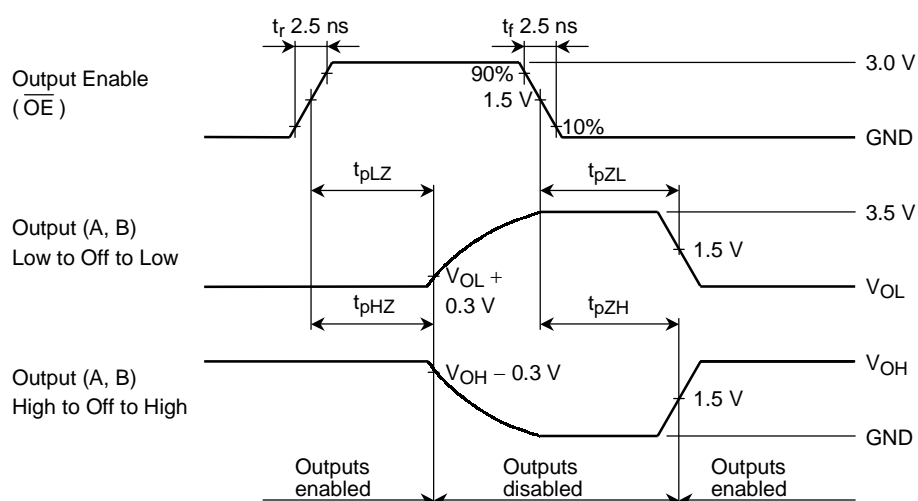
$C_L = 50 \text{ pF}$   
 $R_L = 500 \Omega$

Parameter	Switch
$t_{pLH}$ , $t_{pHL}$	Open
$t_{pLZ}$ , $t_{pZL}$	7.0 V
$t_{pHZ}$ , $t_{pZH}$	Open

## AC Waveform



### Figure 2 $t_{pLH}$ , $t_{pHL}$



**Figure 3**  $t_{pLZ}$ ,  $t_{pHZ}$ ,  $t_{pZL}$ ,  $t_{pZH}$

$V_{OH} - V_{CC}$  Characteristics (typ.)

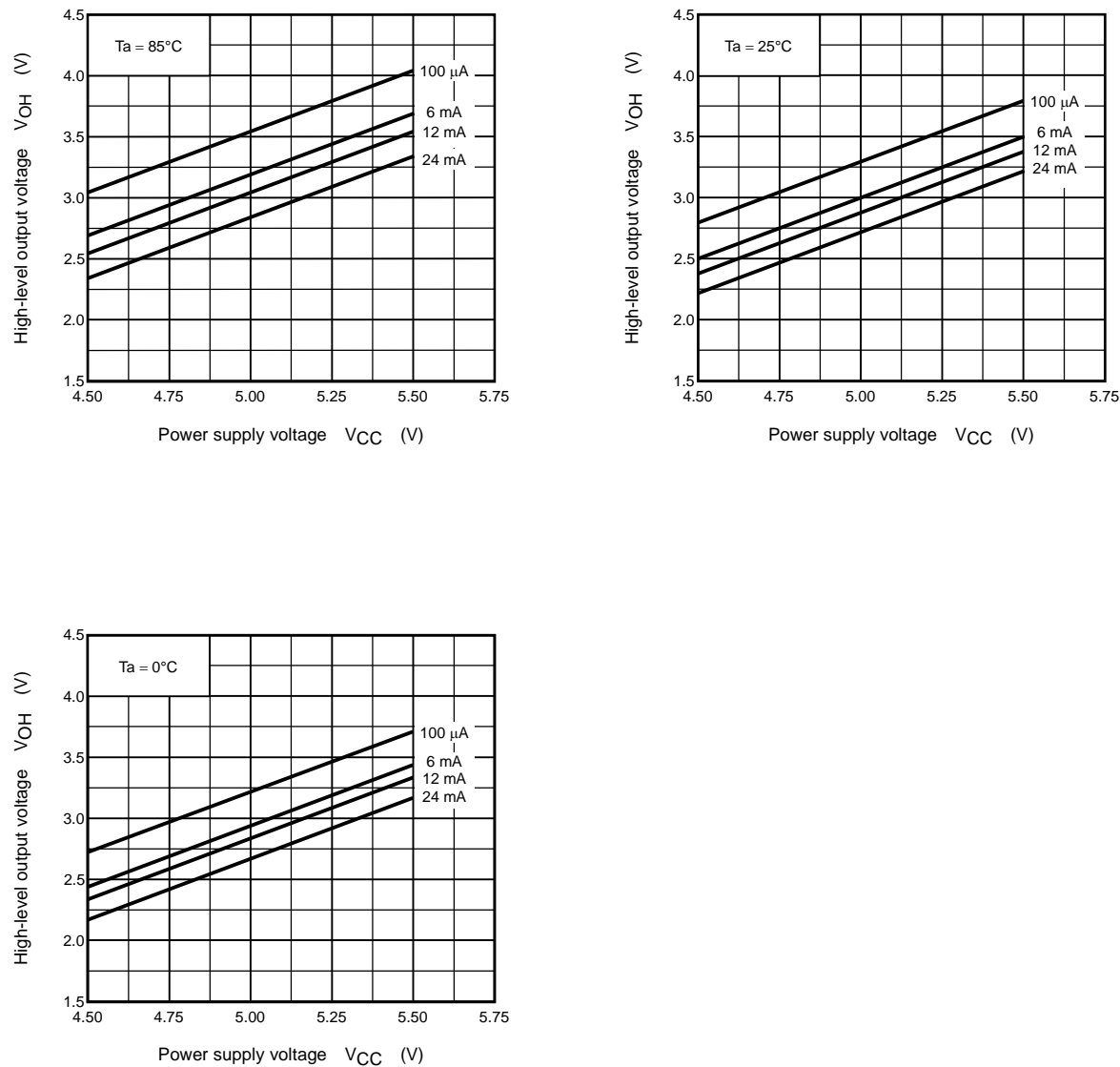
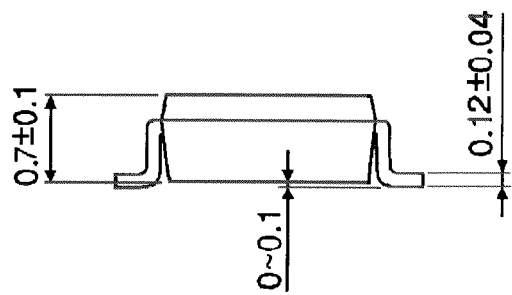
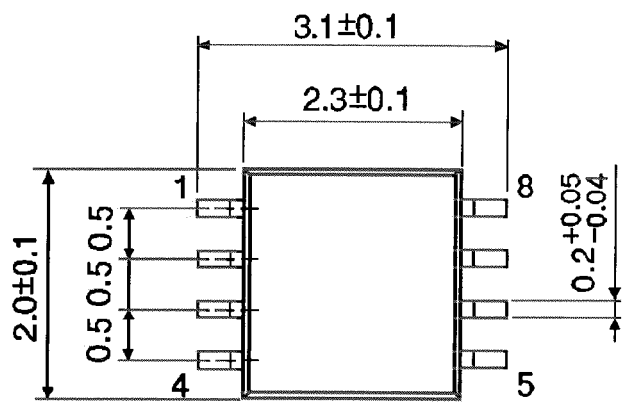


Figure 4

Package Dimensions

SSOP8-P-0.50A

Unit : mm



Weight: 0.01 g (typ.)

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